

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference SC11714TP	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/US 02/ 18475	International filing date (day/month/year) 11/06/2002	(Earliest) Priority Date (day/month/year) 26/07/2001
Applicant MOTOROLA, INC.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 6 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☐ the text is approved as submitted by the applicant.

☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figur No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

7
☐ None of the figures.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 02/18475

Box III TEXT OF THE ABSTRACT (Continuation of it m 5 f the first sheet)

A metal oxide, utilized as a gate dielectric (22), is removed using a combination of gaseous HCl heat, and an absence of rf. The metal oxide which is preferably hafnium oxide, is effectively removed in the areas not under the gate electrode (18). The use of HCl results in the interfacial oxide (25) that underlies the metal oxide not being removed. The interfacial oxide is removed to eliminate the metal and is replaced by another interfacial oxide layer (27). The subsequent implant steps are thus through just an interfacial oxide (27) and not through a metal oxide. Thus, the problems associated with implanting through a metal oxide are avoided.

INTERNATIONAL SEARCH REPORT

In. .ional Application No
PCT/US 02/18475

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H01L21/311

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

CHEM ABS Data, EPO-Internal, WPI Data, PAJ, INSPEC, IBM-TDB

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	PATENT ABSTRACTS OF JAPAN vol. 2002, no. 07, 3 July 2002 (2002-07-03) -& JP 2002 075972 A (HITACHI LTD), 15 March 2002 (2002-03-15)	1,4,11, 13,21,25
P,A	abstract	6,27
X	US 6 162 738 A (CHEN GARY ET AL) 19 December 2000 (2000-12-19)	1,13,21
A	column 9	6
X	PATENT ABSTRACTS OF JAPAN vol. 1999, no. 03, 31 March 1999 (1999-03-31) -& JP 10 340893 A (SONY CORP), 22 December 1998 (1998-12-22)	13,14, 16,21, 22,25
A	abstract paragraph '0016! - paragraph '0038!	1,4
	--- -/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *&* document member of the same patent family

Date of the actual completion of the international search

19 November 2002

Date of mailing of the international search report

29/11/2002

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Szarowski, A

INTEF TIONAL SEARCH REPORT

In tional Application No

PCT/US 02/18475

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KUO Y: "ANOMALOUS HIGH RATE REACTIVE ION ETCHING PROCESS FOR INDIUM TIN OXIDE" JAPANESE JOURNAL OF APPLIED PHYSICS, PUBLICATION OFFICE JAPANESE JOURNAL OF APPLIED PHYSICS. TOKYO, JP, vol. 36, no. 5B, 15 May 1997 (1997-05-15), pages L629-L631, XP000728848 ISSN: 0021-4922 abstract ---	13,21-23
X	US 5 776 356 A (ITOH YASUYUKI ET AL) 7 July 1998 (1998-07-07) example 1 ---	13,21
X	US 6 037 268 A (DAUTARTAS MINDAUGAS FERNAND ET AL) 14 March 2000 (2000-03-14) the whole document ---	13,21
X	WO 00 34985 A (KRAHL KERSTIN ;WEGE STEPHAN (DE); INFINEON TECHNOLOGIES AG (DE)) 15 June 2000 (2000-06-15) the whole document ---	1,21
X	US 4 708 766 A (HYNECEK JAROSLAV) 24 November 1987 (1987-11-24) column 3 ---	21,22
A	"METHOD FOR ETCHING OF HAFNIUM AND ZIRCONIUM OXIDE METAL LAYERS" RESEARCH DISCLOSURE, KENNETH MASON PUBLICATIONS, HAMPSHIRE, GB, no. 302, 1 June 1989 (1989-06-01), page 401 XP000034720 ISSN: 0374-4353 the whole document ---	1-4,13, 14, 21-23, 25,27,29
A	KANNIAINEN T ET AL: "Growth of dielectric HfO ₂ /Ta ₂ O ₅ thin film nanolaminate capacitors by atomic layer epitaxy" ELECTROCHEMICAL SOCIETY PROCEEDINGS, ELECTROCHEMICAL SOCIETY, PENNINGTON, NJ, US, 31 August 1997 (1997-08-31), pages 36-46, XP002093697 ISSN: 0161-6374 the whole document ---	1,2,4, 13,14, 16,21, 22,25
A	FR 2 694 131 A (BALZERS HOCHVAKUUM) 28 January 1994 (1994-01-28) the whole document ---	1,2,4, 13,14, 16,21, 22,25
	---	--- -/--

INTERNATIONAL SEARCH REPORT

In International Application No

PCT/US 02/18475

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6 004 850 A (HOBBS CHRISTOPHER C ET AL) 21 December 1999 (1999-12-21) the whole document ----	1,2,5, 21,22
A	DATABASE WPI Section Ch, Week 197851 Derwent Publications Ltd., London, GB; Class L03, AN 1978-91887A XP002221367 & JP 53 129971 A (MATSUSHITA ELEC IND CO LTD), 13 November 1978 (1978-11-13) abstract -----	